uredinium, and *telium* in substitution for teleuto, uredo, aecidial, and spermagonial stages" of the rusts, instead of the reverse order. On page 467 *Trametes Pini* is said to be the "chief cause of loss among fungi."

On the whole, the book is an excellent presentation of the subject of plant pathology from an American standpoint. Most of its shortcomings relate to individual or minor details. In it the vast amount of material collected through the agencies of the experiment stations and the U.S. Department of Agriculture has been brought together for the first time in an easily available form. The facts presented are largely derived from American work and apply to American conditions. It is sufficiently comprehensive for a textbook, and will be of much service as a reference book in the field which it represents. The style is clear and concise, and the arrangement is that which the teacher would naturally adopt. The free citation of literature is of great service to both student and teacher. The book is abundantly illustrated, and both illustrations and press work are all that could be desired.—H. HASSELBRING.

The morphology of plants

The third and last volume of VELENOVSKÝ'S textbook[4] on the comparative morphology of plants deals with the flower of phanerogams, the ovule, pollination, embryo, seed, fruit, and the evolution of plants. Fertilization, parthenogenesis, and polyembryony are treated under the section on the ovule, preceding the description of pollination. The volume opens with the following definition of a flower: "The flower of phanerogams is a shortened axis of limited growth, which carries foliar organs adapted to the purposes of fertilization." We are assured that this definition applies to all cases except the female structures of the genus *Cycas*, which are not regarded as flowers.

The book deals almost entirely with the grosser external features of plants, little attention being given to the details of development. It must be confessed that the phase of morphology represented by this book is somewhat neglected by modern morphologists, who are likely to pay insufficient attention to the taxonomic side of botany. Morphologists should find the work useful as a reference and as a supplement to their taxonomy; but as a complete textbook of morphology it is not comprehensive enough to meet modern demands.—CHARLES J. CHAMBERLAIN.

NOTES FOR STUDENTS

The cretaceous plants of Japan.[5]—This interesting product of the Anglo-Japanese understanding represents the structural study of partly calcified and partly silicified nodules from the Upper Cretaceous of Hokkaido in northern

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[4] VELENOVSKÝ, JOS., Vergleichende Morphologie der Pflanzen. Vol. III. pp. 478. *pls. 6–9. figs. 400.* Prag: Fr. Řivnáč. 1910. For review of vols. I and II see BOT. GAZETTE **44**:310. 1907.

[5] STOPES, MARIE C., and FUJII, K., Studies on the structure and affinities of cretaceous plants. Phil. Trans. Roy. Soc. London B **201**:1–90. *pls. 1–9.* 1910.

Japan. Only in rare instances were the authors able to make out the external form of the material studied, and in no case do they seem to have been able to correlate it with the extremely abundant cretaceous genera known from impressions. To this initial disadvantage is added a not entirely satisfactory familiarity with the anatomical structure of living angiosperms and conifers. The eighteen species described as new in the memoir are consequently in some cases not really new, since they represent the parts of plants already known from impressions and recently identified structurally by American paleobotanists. In other instances the anatomical characterization is too vague and indefinite for subsequent use. In spite of these drawbacks, the memoir under discussion must rank as one of the most important recent contributions on the cretaceous flora, and it is much to be desired that the authors may be able to continue their investigations as they promise to do.

Of the eighteen species described, four are cryptogamic, one being a fungus and three others ferns. An interesting cycad-like leaf, *Niponophyllum*, is described which differs from the leaf structure of living cycads in the complete absence of centrifugal wood, all the xylem being of the cryptogamic centripetal type.

Of the other gymnosperms described, the most interesting is *Yezonia*, which is considered by the authors to represent a new genus, and of which they state "it is impossible to find any family among the gymnosperms with which we can satisfactorily include this plant." This view of the matter will hardly stand, since in every detail of structure it corresponds absolutely with *Brachyphyllum*, the commonest conifer of the later Mesozoic, which, moreover, on anatomical grounds has been recognized recently as an araucarian conifer. Another gymnospermous branch is also described under the new generic name *Cryptomeriopsis*. Of this it may be stated that the description given of its internal organization by the Anglo-Japanese authors parallels with fidelity, so far as it goes, that of *Geinitzia Reichenbachi*, recently described structurally from the North American Cretaceous. Two imperfect coniferous cones are likewise characterized, *Yezostrobus* and *Cunninghamiostrobus*. One *Araucarioxylon* and two species of *Cedroxylon* complete the list of coniferous remains.

Either as the result of a bad condition of preservation, or a failure to realize clearly the importance of detailed description, four angiospermous ligneous genera, all considered to be new (*Jugloxylon*, *Populocaulis*, *Fagoxylon*, *Sabiocaulis*), are insufficiently characterized. The detailed structure of the rays, the characters of the vessels and wood fibers, as well as the distribution of wood parenchyma, all important features in the description of angiospermous fossil woods, are entirely or almost entirely omitted. If the omission is due to faulty preservation, the woods are scarcely worth publishing. The genus *Saururopsis* is somewhat more clearly characterized. One genus (*Cretovarium*) representing a tricarpellary ovary is likewise described, but as the accompanying vegetative organs and even any considerable part of the floral apparatus itself are absent, it seems impossible to arrive at any satisfactory conclusion as to its affinities. One curious and unfortunate omission throughout the memoir is the almost com-

plete failure to indicate the magnification used in the figures. This makes comparisons on the part of other workers difficult or even impossible.

In spite of the exceptions taken in various respects to the work of the Anglo-Japanese authors, it must be conceded that their line of investigation is one of great promise, and it is to be hoped that they will feel encouraged to continue it with a greater attention to definiteness in anatomical characterization.—E. C. JEFFREY.

Vascular anatomy of Gleichenia.—BOODLE and HILEY,[6] from the study of the anatomy of *Gleichenia pectinata* and allied species, reach certain theoretical conclusions as to the origin of the tubular medullated stele. They report the result of the examination of the node and internode, as well as the branching stem, of certain species of *Gleichenia*, particularly *G. pectinata*. It is not surprising that they reach substantially the conclusions which have been published already by the senior author in earlier contributions. The published results in this case, however, appear to indicate a certain modification of the position originally held by BOODLE, to the effect that in all cases the pith is a part of the stele and is not derived by inclusion of the fundamental or ground tissue from outside the central cylinder; for the authors in this article use the term solenostelic, borrowed from GWYNNE-VAUGHAN and employed by him in the sense of a tubular stele with internal as well as external phloem and inclosing fundamental tissue as a pith (a meaning stated by GWYNNE-VAUGHAN himself to be equivalent to the reviewer's siphonostelic with internal phloem). Although the English writers in this instance concede apparently the arrival of the solenostelic condition as the final result of the modification of the pithless protostele, they express the opinion that the pith appears first as the result of the transformation of some of the tracheids into a central mass of parenchyma, a condition followed by the appearance of ramular gaps in the stele as the result of branching, leading to the intrusion of phloem from the outside of the stele and ultimately of the fundamental tissue itself. Only at the end of the process do the leaf gaps appear and become patent.

These views are all the more remarkable because in the same article the authors concede that the islands of parenchyma occurring in the petiolar strands of certain representatives of the Gleicheniaceae are derived from the cortex by inclusion, and were originally surrounded both by internal phloem and internal endodermis. The condition in which the included parenchyma is separated from the vascular tissues of the petiole by neither endodermis nor internal phloem is a result of progressive degeneracy. It appears almost an extreme example of the perversity of the human mind to explain the occurrence of central parenchyma in the leaf trace in a node diametrically opposite to that adopted for the appearance of a pith in the vascular tissues of the stem. If the fundamental tissues may be included in the leaf trace, there appears to be no reason why a similar process should not lead to the formation of pith in the axis. The adoption of this hypoth-

[6] BOODLE and HILEY, On the vascular structure of some species of *Gleichenia*. Annals of Botany **23**:419–432. *pl. 29*. 1909.